IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	10/730,438
Inventor(s)	:	Martin Schnabel et al.
Filed	:	December 8, 2003
Art Unit	:	3761
Examiner	:	Adam M. Marcetich
Docket No.	:	CM2713Q
Confirmation No.	:	2354
Customer No.	:	27752
Title	:	Absorbent Article Having Pigmented Composite Backsheet With Hunter Value

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

This Brief is filed in support of an appeal from the decision communicated in the Final Office Action mailed on August 19, 2010.

A timely Notice of Appeal was filed on November 19, 2010.

REAL PARTY IN INTEREST

The real party in interest is The Procter & Gamble Company of Cincinnati, Ohio.

RELATED APPEALS AND INTERFERENCES

Applicants are not aware of any related appeals or interferences.

STATUS OF CLAIMS

Claims 1-11 are pending in the present application.

Claims 1-11 stand rejected and the rejections are the subject of the instant appeal.

STATUS OF AMENDMENTS

The claims in this application were last amended by Applicants in an Amendment filed January 19, 2010, prior to the final rejection from which the instant appeal is taken. It is believed that all amendments have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

The application has one independent claim, Claim 1.

The subject matter of Claim 1 concerns a disposable article selected from baby diapers, pull-on diapers, pants or adult incontinence diapers, comprising the following elements:

Claim Element	*Non-Limiting Description in Specification*
a liquid pervious topsheet,	Page 5, lines 10-11, 27-28
a liquid impervious backsheet and	Page 5, lines 10-12
an absorbent core positioned between said topsheet and said backsheet,	Page 5, lines 12-13, 29-32
wherein said backsheet comprises at least one polymeric film and at least one nonwoven web formed of fibers,	Page 6, lines 19-28; page 7, lines 16-28
wherein said polymeric film and said nonwoven web each have two major surfaces,	Page 8, lines 5-11
said polymeric film comprises a polymeric film material, and	Page 7, lines 4-15
said nonwoven web fibers comprise a polymeric nonwoven web material,	Page 7, lines 29-30
wherein at least one of said polymeric film material or said polymeric nonwoven web material is color-pigmented by one or more pigments mixed thereinto prior to formation of said polymeric film or said nonwoven web, and	Page 9, lines 1-22
wherein at least one of said polymeric film or said nonwoven web has visually discernible printed designs, said printed designs being provided by printing a pigmented ink onto at least one of said major surfaces of at least one of said polymeric film or said nonwoven web, and	Page 10, line 17 – page 11, line 17

said polymeric film being joined in an overlaying region across at least part of one of its major surfaces to at least part of an adjacent major surface of said nonwoven web to form said backsheet, and	Page 4, lines 11-14
wherein said backsheet in said overlaying region has an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 75, an "a" value for red/green-appearance from about –50.0 to about +50.0 and a "b" value for yellow/blue-appearance from about –50.0 to about +50.0, in the areas outside the printed designs.	Page 13, lines19-21; page 14, lines 25-27; page 15, lines 1-6

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

a) Whether Claims 1, 3, 4, 10 and 11 are properly rejected under 35 U.S.C. §103(a) over Schleinz et al. (U.S. Pat. No. 5,458,590) in view of Costolow (U.S. Pat. No. 3,972,854).

b) Whether Claims 2, 5 and 6 are properly rejected under 35 U.S.C. §103(a) over Schleinz et al. (U.S. Pat. No. 5,458,590) in view of Costolow (U.S. Pat. No. 3,972,854), and further in view of McCormack et al. (U.S. Pat. No. 6,719,742).

ARGUMENT

A. Requirements for *Prima Facie* Case of Obviousness

1. Claimed Invention As A Whole Must Be Considered.

Under MPEP §2142, the Office bears the burden of factually supporting an asserted *prima facie* conclusion of obviousness. In determining the differences between the cited art and the claims, the question is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *See, e.g., Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537; 218 U.S.P.Q. 871 (Fed. Cir. 1983). If the Office does not demonstrate *prima facie* unpatentability, then without more, the Applicant is entitled to the grant of the patent. *See In re Oetiker*, 977 F.2d 1443, 1445; 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992).

2. All Claim Elements Must Be Taught Or Suggested By Prior Art.

To establish a *prima facie* case of obviousness under 35 U.S.C. §103, the Office must show that all of the claim elements are taught or suggested in the prior art. *See, e.g., CFMT, Inc. v. Yieldup Int'l Corp.*, 349 F.3d 1333, 1342; 68 U.S.P.Q.2d 1940 (Fed. Cir. 2003).

3. A Teaching, Motivation or Suggestion to Combine the Cited References Must be Found in the Prior Art.

> [A] patent [claim] composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.

KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 1741, 82 U.S.P.Q.2D 1385 (2007). Accordingly,

> a flexible TSM test remains the primary guarantor against a non-statutory hindsight analysis . . . . *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) ("[A]s the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention."). The TSM test, flexibly applied, merely assures that the obviousness test proceeds on the basis of evidence—teachings, suggestions (a tellingly broad term), or motivations (an equally broad term)—that arise before the time of invention as the statute requires. As KSR requires, those teachings, suggestions, or motivations need not always be written references but may be found within the knowledge and creativity of ordinarily skilled artisans.

Ortho-McNeil Pharmaceutical, Inc. v. Mylan Labs., Inc., 520 F.3d 1358, 1364-1365; 86 U.S.P.Q.2D 1196 (Fed. Cir. 2008) (judgment of nonobviousness and infringement affirmed). The lack of evidence of a motivation to combine is a critical defect in an obviousness conclusion, because there must be some suggestion, motivation, or teaching in the prior art whereby the person of ordinary skill would have selected the components that the inventor selected and use them to make the new device. *Golight, Inc. v. Wal-Mart Stores, Inc.*, 355 F.3d 1327, 1336; 69 U.S.P.Q.2d 1481, 1488 (Fed. Cir. 2004).

> Further,
>
> . . . [t]here is no suggestion to combine [references] . . . if a reference teaches away from its combination with another source. *See id.* at 1075, 5 U.S.P.Q.2D (BNA) at 1599. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant . . . [or] if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant." *In re Gurley*, 27 F.3d 551, 553, 31 U.S.P.Q.2D (BNA) 1130, 1131 (Fed. Cir. 1994). If when combined, the references "would produce a seemingly inoperative device," then they teach away from their combination. *In re Sponnoble*, 56 C.C.P.A. 823, 405 F.2d 578, 587, 160 U.S.P.Q. (BNA) 237, 244 (CCPA 1969); *see also In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. (BNA) 1125,

> 1127 (Fed. Cir. 1984) (finding no suggestion to modify a prior art device where the modification would render the device inoperable for its intended purpose).

Tec Air, Inc. v. Denso Mfg. Michigan Inc., 192 F.3d 1353, 1359-1360; 52 U.S.P.Q.2d 1294 (Fed. Cir. 1999). "It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art." *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 448, 230 U.S.P.Q. 416 (Fed. Cir. 1986), *quoting In re Wesslau*, 353 F.2d 238, 241, 147 U.S.P.Q. 391, 393 (C.C.P.A. 1965).

B. Analysis

1. The Combinations of Cited References Do Not Teach or Suggest All Elements of Applicants' Claims.

a) Claims 1, 3, 4, 10 and 11; Schleinz et al. and Costolow

Current Independent Claim 1 recites a disposable article selected from baby diapers, pull-on diapers, pants or adult incontinence diapers comprising, *inter alia*, a backsheet that comprises at least one polymeric film and at least one nonwoven web formed of fibers, wherein said polymeric film and said nonwoven web each have two major surfaces, said polymeric film comprises a polymeric film material, and said nonwoven web fibers comprise a polymeric nonwoven web material, wherein at least one of said polymeric film material or said polymeric nonwoven web material is color-pigmented by one or more pigments mixed thereinto prior to formation of said polymeric film or said nonwoven web, and wherein at least one of said polymeric film or said nonwoven web has visually discernible printed designs, said printed designs being provided by printing a pigmented ink onto at least one of said major surfaces of at least one of said polymeric film or said nonwoven web, and said polymeric film being joined in an overlaying region across at least part of one of its major surfaces to at least part of an adjacent major surface of said nonwoven web to form said

backsheet, and wherein said backsheet in said overlaying region has an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 75, an "a" value for red/green-appearance from about –50.0 to about +50.0 and a "b" value for yellow/blue-appearance from about –50.0 to about +50.0, in the areas outside the printed designs. By dependency, each of the remaining rejected claims includes all of these elements.

Applicants submit that Schleinz et al. and Costolow, neither alone nor combined, teach or suggest a composite backsheet (*i.e.*, combination of polymer film and nonwoven) having printed designs, with an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 75, an "a" value for red/green-appearance from about –50.0 to about +50.0 and a "b" value for yellow/blue-appearance from about –50.0 to about +50.0, in the areas outside the printed designs.

Schleinz et al. addresses inks and the crockfastness of inks after printing. It is silent concerning the coloration (expressed in L Hunter value) of a substrate upon which printing is done, in areas outside the printing.

Costolow teaches a method for color control and stabilization of fiber-grade polypropylene, involving admixing various agents to polypropylene homopolymer under process conditions that regulate the presence of oxygen in the mixing atmosphere. (*See* Costolow at Col. 1, lines 36-50.) As best understood by Applicants, Costolow does not teach tinting or pigmentation of the polypropylene to arrive at an end product falling within particular color/lightness ranges. Rather, it appears that Costolow only teaches monitoring and striving to achieve particular Hunter values *in the pellet product* of the described process as an indication that oxygen present in the mixing process is being properly regulated (Costolow at Col. 4, lines 20-33), and to assure that the process results in a product "generally preferred for use in [subsequently] producing dyed or pigmented fiber products while maintaining lightness (L) essentially constant." (Costolow at Col. 5, lines 22-24.)

Importantly, Costolow *does not teach a disposable absorbent article, a combination backsheet, a nonwoven web component of a backsheet, or even a nonwoven web*, having particular Hunter color/lightness values. Rather, Costolow teaches only polypropylene *pellets* having particular Hunter values. (Costolow at Fig. 1 (lower right); col. 1, line 67 – col. 2, line 5 ("pelleted fiber-grade polypropylene compositions".) Costolow neither teaches, nor contains any mention or even a hint of a suggestion of forming a composite backsheet for an absorbent article having these values.

For this reason, Applicants respectfully submit that the combination of Schleinz et al. and Costolow does not teach or suggest all elements of Applicants' claims, and therefore, does not support a *prima facie* conclusion of obviousness of the claims.

b) Claims 2, 5 and 6; Schleinz et al., Costolow and McCormack et al.

To reject Claims 2, 5 and 6, the Office relies on the combination of Schleinz et al. and Costolow, discussed above, combined with McCormack et al.

As discussed above, Schleinz et al. and Costolow, neither alone nor combined, teach or suggest a composite backsheet (*i.e.*, combination of polymer film and nonwoven) having printed designs, with an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 75, an "a" value for red/green-appearance from about –50.0 to about +50.0 and a "b" value for yellow/blue-appearance from about –50.0 to about +50.0, in the areas outside the printed designs. Since Claims 2, 5 and 6 are dependent on Claim 1, and therefore narrower, the combination of Schleinz et al. and Costolow also does not teach or suggestion all elements of Claims 2, 5 and 6.

McCormack et al. does not provide teaching or suggestion of the claim elements missing from Schleinz et al. and Costolow. McCormack et al. teaches an embossed composite polymer film formed of at least two layers. McCormack et al. teaches that one layer (the second, "dark" layer) of the composite film may have a coloring agent added to

give it a color, and imparting a CIE L*a*b* L* value that is darker than the first layer, but still, above 70. (McCormack et al., col. 1, line 66 – col. 2, line 15; col. 14, lines 32-42; and col. 19 (TABLE 1).) McCormack et al. is silent on the subject of printing, and contains no teaching or suggestion of a *composite backsheet* with an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 75, in areas outside printed designs.

Thus, the Office has not shown that all elements of Applicant's Claims 2, 5 and 6 are taught or suggested in the prior art, and therefore, has not established a *prima facie* conclusion of obviousness of the claims.

2. *A Teaching, Motivation or Suggestion for the Combination of the Cited References in a Manner That Arrives at Applicants' Claims Has Not Been Established.*

Schleinz et al. addresses crockfastness (*i.e.*, resistance to rubbing wear) of ink printing on products such as diapers. There is no mention in Schleinz et al. of a problem of translucency or to look for ways to address a problem of translucency – and thus, no teaching, motivation or suggestion to consult other art, within the scope of materials used for diapers or outside that scope – to address translucency.

Costolow addresses a problem of producing a pelletized polypropylene raw material that is color-stable and "generally preferred for use in [subsequently] producing dyed or pigmented fiber products while maintaining lightness (L) essentially constant." (Costolow at Col. 5, lines 22-24.)

Schleinz et al. and Costolow respectively address differing problems in differing contexts, and neither addresses the problem of translucency of a relatively thin composite backsheet – the problem addressed by Applicants.

Attempting to identify a basis to combine these references, the Office states:

> . . . Schleinz calls for printing with bright colors (col. 6, lines 40-44). Polypropylene having the L*a*b* values within the ranges of Costolow provides a bright background for these images. Therefore, it would have been obvious to one of ordinary skill in the art . . . to modify the invention of [Schleinz] as discussed with the fiber-grade polypropylene of Costolow in order to provide a bright background for printing images as called for by Schleinz.

(Office Action (8/19/2010) at pages 5-6.)

Applicants respectfully submit that the foregoing does not identify a prior art teaching, motivation or suggestion to combine Costolow with Schleinz et al., whereby the backsheet of Schleinz is modified by teachings of Costolow such that it would fall within Applicants' claims.

First, the Office, here the party having the burden or proof, has provided no evidentiary support for its assertion that "[p]olypropylene having the L*a*b* values within the ranges of Costolow provides a bright background for [Schleinz's] images." Costolow teaches polypropylene pellets having a Hunter L value in the range of 50 to 60. (Costolow, col. 2, line 5.) Exhibit 1 in the Evidence Appendix submitted herewith is publicly available information (obtained from the Internet at www.hunterlab.com) from HunterLab, concerning the Hunter color scale. It can be seen from reviewing this information that a Hunter L value in the range of 50 to 60 (as taught by Costolow, col. 2, line 5) would be approximately midway between white and black in brightness/darkness. The Office has not provided definition or context enabling a determination of what it means by "bright" in the statement "it would have been obvious to one of ordinary skill in the art . . . to modify the invention of [Schleinz] as discussed with the fiber-grade polypropylene of Costolow in order to provide a bright background for printing images as called for by Schleinz." Regardless, it seems at best subjective, and further, difficult to support a conclusion, that a substrate having a Hunter L value in the range of 50-60 would be considered "bright." There is no evidence

whatsoever of any suggestion in Schleinz et al. that such a substrate coloration would be desirable.

Second, accepting the Office's assertion that Schleinz et al. calls for a "bright background" for printing, this would only teach away from a backsheet substrate having a Hunter L value of 50-60, midway between black and white. Additionally, prior art the Office has cited Office in this case[1] strongly suggests that a backsheet for an article of the type of Applicants' claims (*e.g.*, diapers) having a Hunter L value of 50-60 as described by Costolow, *would be undesirable*. (*See* PTC Application No. WO 99/32164 (by Tao et al.) (Exhibit 2 in Evidence Appendix), at page 2, lines 23-26 ("a high degree of whiteness, *i.e.*, the visual appearance of the white color of the article as seen by the consumer, is very important to the consumer. Consumers tend not to accept articles that incorporate films having a yellowish or off-white shade.") Thus, evidence of record teaches away from a combination of Costolow with Schleinz et al., and modification of Schleinz et al., in a manner that would bring it within the scope of Applicants' claims.

In summary, Schleinz et al. addresses printing ink compositions and contains no suggestion of a modification or combination with other art to address a problem of translucency of a backsheet print substrate; Costolow addresses color consistency of polypropylene pellet stock and contains no suggestion of a problem of translucency in backsheets for diapers, or that the Hunter L values it discloses has applicability to backsheets for absorbent articles; and elsewhere in the prior art cited by the Office it is suggested that coloring a diaper backsheet (outside printed regions) to the Hunter L values of Costolow would be undesirable.

For these reasons, Applicants respectfully submit that a teaching, motivation or suggestion of a combination of Schleinz et al. and Costolow has not been established.

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1 Office Action dated 4/23/2008, ¶ 6.

Conclusion

For the reasons discussed above and under the authorities cited, Applicants respectfully request that all rejections of their pending claims be REVERSED.

Respectfully submitted,

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Date: January 19, 2011
Customer No. 27752
(Amendment-Response to Office Action.doc)
Revised 02/09/2009

CLAIMS APPENDIX

1. A disposable article selected from baby diapers, pull-on diapers, pants or adult incontinence diapers comprising a liquid pervious topsheet, a liquid impervious backsheet and an absorbent core positioned between said topsheet and said backsheet, wherein said backsheet comprises at least one polymeric film and at least one nonwoven web formed of fibers, wherein said polymeric film and said nonwoven web each have two major surfaces, said polymeric film comprises a polymeric film material, and said nonwoven web fibers comprise a polymeric nonwoven web material, wherein at least one of said polymeric film material or said polymeric nonwoven web material is color-pigmented by one or more pigments mixed thereinto prior to formation of said polymeric film or said nonwoven web, and wherein at least one of said polymeric film or said nonwoven web has visually discernible printed designs, said printed designs being provided by printing a pigmented ink onto at least one of said major surfaces of at least one of said polymeric film or said nonwoven web, and said polymeric film being joined in an overlaying region across at least part of one of its major surfaces to at least part of an adjacent major surface of said nonwoven web to form said backsheet, and wherein said backsheet in said overlaying region has an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 75, an "a" value for red/green-appearance from about –50.0 to about +50.0 and a "b" value for yellow/blue-appearance from about –50.0 to about +50.0, in the areas outside the printed designs.

2. The disposable article according to claim 1, wherein said backsheet in said overlaying region has an opacity from about 55% to about 100% in the areas outside the printed designs.

3. The disposable article according to claim 1, wherein one of said two major surfaces of said polymeric film and said nonwoven web is a garment facing surface and said

discernible printed designs are provided by printing on at least one of said garment facing surfaces of said polymeric film or said nonwoven web.

4. The disposable article according to claim 1, wherein said backsheet comprises a garment facing layer and a body facing layer and said nonwoven web is comprised by said garment facing layer and said polymeric film is comprised by said body facing layer.

5. The disposable article according to claim 1, wherein said printed designs comprise not more than about 50% of at least one of the two major surfaces of said backsheet.

6. The disposable article according to claim 1, wherein more than about 60 % of said printed designs coincide with the area covered by said absorbent core.

7. The disposable article according to claim 1, wherein said disposable article comprises a rear waist edge and said absorbent core comprises a rear core end edge and wherein the distance between said rear end edge and said rear core end edge comprises at least about 40 mm.

8. The disposable article according to claim 1, wherein said printing is applied such, that the effect of an additional color is created by covering at least a first area of at least one of said major surfaces of at least one of said polymeric film or said nonwoven web with opaque ink in a halftoning process while covering at least a second area completely with the same ink.

9. The disposable article according to claim 1, wherein said printing is applied such that the effect of an additional color is created by covering at least a first area of at least one of said major surfaces of at least one of said polymeric film or said nonwoven web with a relatively thin layer of a transparent ink while applying a relatively thick layer of the same ink in at least a second area.

10. The disposable article of claim 1, wherein said backsheet in said overlaying region has an L Hunter value on the Hunter scale for darkness/lightness-appearance from 10 to 65, in the areas outside the printed designs.

11. The disposable article of claim 1, wherein said backsheet in said overlaying region has an "a" value for red/green-appearance from about –30.0 to about +30.0 and a "b" value for yellow/blue-appearance from about –35.0 to about +25.0, in the areas outside the printed designs.

EVIDENCE APPENDIX

Exhibit 1 – "Hunter L, a, b Color Scale" (2008) published online at www.hunterlab.com

Exhibit 2 – PCT patent application WO 99/32164 (Tao et al.)

Application Note

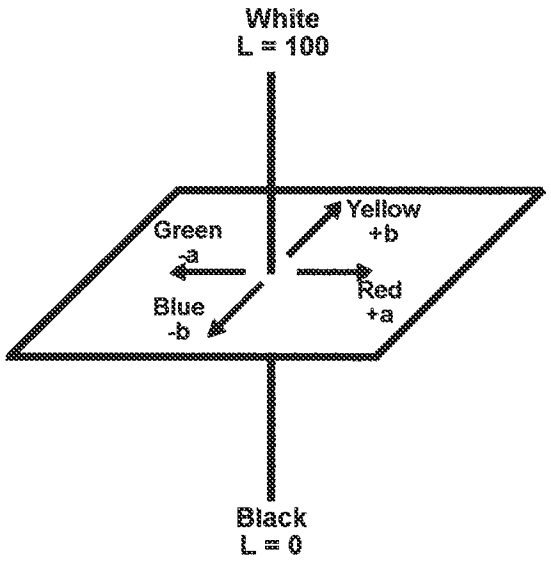
Insight on Color Vol. 8, No. 9

Hunter L, a, b Color Scale

Background

The Hunter L, a, b color scale evolved during the 1950s and 1960s. At that time, many of the scientists involved with color measurement were working on uniform color scales. The XYZ system was being used, but it did not give a good indication of sample color based solely on the numbers. The uniform color scales being investigated gave better indications of the color of a sample based solely on the numbers. There were several permutations of the Hunter L, a, b color scale before the current formulas were released in 1966.

The Hunter L, a, b color scale is more visually uniform than the XYZ color scale. In a uniform color scale, the differences between points plotted in the color space correspond to visual differences between the colors plotted. The Hunter L, a, b color space is organized in a cube form. The L axis runs from top to bottom. The maximum for L is 100, which would be a perfect reflecting diffuser. The minimum for L would be zero, which would be black. The a and b axes have no specific numerical limits. Positive a is red. Negative a is green. Positive b is yellow. Negative b is blue. Below is a diagram of the Hunter L, a, b color space.



There are delta values (ΔL, Δa, and Δb) associated with this color scale. These values indicate how much a standard and sample differ from one another in L, a, and b. The ΔL, Δa, and Δb values are often used for quality control or formula adjustment. Tolerances may be set for the delta values. Delta values that are out of tolerance indicate that there is too much difference between the standard and the sample. The type of correction needed may be determined by which delta value is out of tolerance. For example, if Δa is out of tolerance, the redness/greenness needs to be adjusted. Whether the sample is redder or greener than the standard is indicated by the sign of the delta value. For example, if Δa is positive, the sample is redder than the standard.

The total color difference, ΔE, may also be calculated. ΔE is a single value that takes into account the differences between the L, a, and b of the sample and standard. It does not indicate which parameter is out of tolerance if ΔE is out of tolerance. It may also be misleading in some cases where ΔL, Δa, or Δb is out of tolerance, but ΔE is still within the tolerance.

The Hunter L, a, b color scale may be used on any object whose color may be measured. It is not used as frequently today as it was in the past because the CIE L*a*b* scale, which was released in 1976, has gained popularity.

Conditions for Measurement

Instrumental: Any HunterLab color measurement instrument

Illuminant: Any

Standard Observer Function: Either 2 or 10 degree

Transmission and/or Reflectance: Either

Formulas

$$L = 100\sqrt{\frac{Y}{Y_n}}$$

$$a = K_a\left(\frac{X/X_n - Y/Y_n}{\sqrt{Y/Y_n}}\right)$$

$$b = K_b\left(\frac{Y/Y_n - Z/Z_n}{\sqrt{Y/Y_n}}\right)$$

where

X, Y, and Z are the CIE tristimulus values.

X_n, Y_n, and Z_n are the tristimulus values for the illuminant.

Y_n is 100.00.

X_n and Z_n are listed in the tables below.

K_a and K_b are chromaticity coefficients for the illuminant and are listed in the tables below.

CIE 2 Degree Standard Observer

Illuminant	X_n	Z_n	K_a	K_b
A	109.83	35.55	185.20	38.40
C	98.04	118.11	175.00	70.00
D_{65}	95.02	108.82	172.30	67.20
F2	98.09	67.53	175.00	52.90
TL 4	101.40	65.90	178.00	52.30
UL 3000	107.99	33.91	183.70	37.50
D_{50}	96.38	82.45	173.51	58.48
D_{60}	95.23	100.86	172.47	64.72
D_{75}	94.96	122.53	172.22	71.30

CIE 10 Degree Standard Observer

Illuminant	X_n	Z_n	K_a	K_b
A	111.16	35.19	186.30	38.20
C	97.30	116.14	174.30	69.40
D_{65}	94.83	107.38	172.10	66.70
F2	102.13	69.37	178.60	53.60
TL 4	103.82	66.90	180.10	52.70
UL 3000	111.12	35.21	186.30	38.20
D_{50}	96.72	81.45	173.82	58.13
D_{60}	95.21	99.60	172.45	64.28
D_{75}	94.45	120.70	171.76	70.76

$\Delta L = L_{sample} - L_{standard}$ + ΔL means sample is lighter than standard
- ΔL means sample is darker than standard

$\Delta a = a_{sample} - a_{standard}$ + Δa means sample is redder than standard
- Δa means sample is greener than standard

$\Delta b = b_{sample} - b_{standard}$ + Δb means sample is yellower than standard
- Δb means sample is bluer than standard.

$$\Delta E = \sqrt{\Delta L^2 + \Delta a^2 + \Delta b^2}.$$

Typical Applications

This color scale may be used for measurement of the color of any object whose color can be measured.

For Additional Information Contact:

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PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A61L 15/18, 15/24, C08K 3/26, A61L 15/42 — A1

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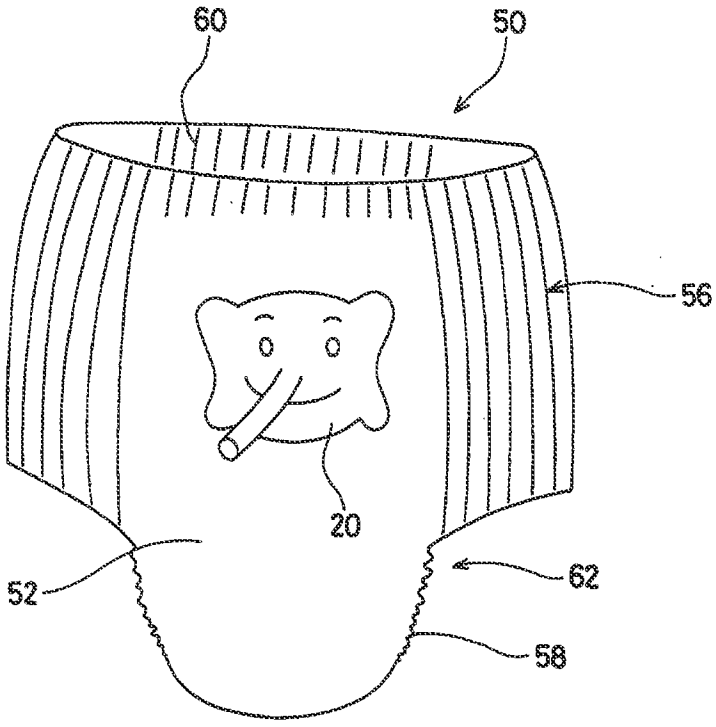
Exhibit 2

(54) Title: DISPOSABLE ABSORBENT ARTICLES COMPRISING MICROPOROUS POLYMER FILMS WITH REGISTERED GRAPHICS

(57) Abstract

A disposable absorbent article is disclosed, comprising a topsheet, a backsheet and an absorbent layer between the topsheet and the backsheet, wherein the backsheet is comprised of a microporous polymer film printed with a registered graphic and comprising by weight: from about 30 % to about 60 % of a polyolefin; and from about 40 % to about 80 % of calcium carbonate; wherein the film has a "b" value of between about 0 and about 0.5 and exhibits less than about 2 % thermal shrinkage at about 50 °C and about 50 % relative humidity for one week.



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DISPOSABLE ABSORBENT ARTICLES COMPRISING MICROPOROUS POLYMER FILMS WITH REGISTERED GRAPHICS

FIELD

The present invention relates to disposable absorbent articles comprising microporous polymer films. More specifically, the present invention relates to disposable absorbent articles comprising microporous polymer films that are particularly suitable for the printing of registered graphics thereon.

BACKGROUND

Polymeric materials provided in the form of films or sheets have been used in a variety of commercial products, including diapers, feminine care products, adult incontinence products, and the like. In the manufacture of disposable absorbent articles, such as diapers, microporous polymer films have generally been incorporated into the structure of the article as a part of the layers that are positioned away from the wearer's body during use (often called "the backsheet"). The backsheet provides a liquid impervious barrier so that exudates absorbed and contained in the absorbent core of the article are prevented from leaking, and particularly so that urine stains outside the diaper are prevented.

A nonwoven material is often laminated or otherwise adhered to a microporous polymer film to form the backsheet of a disposable article. The nonwoven material provides the appearance of cloth and a cloth-like feel on the outside of the garment such that wearers and caregivers perceive a garment-like comfort. The combination of a nonwoven material and a microporous film is suitable for disposable absorbent articles such as diapers, including pull-on type and tape-type diapers, feminine care products, and adult incontinence products. An exemplary pull-on type disposable diaper, which is put on by inserting the wearer's legs into the leg openings and sliding the garment up into position about

the lower torso, is disclosed in Buell U.S. patent 5,569,234, "Disposable Pull-on Pant".

For disposable absorbent articles, especially disposable diapers, it is also often desired to provide graphic designs on the articles to enhance their appearance and their consumer acceptance. In previously known articles, the nonwoven layers have typically been printed with such graphic designs. This is because the printing process for nonwoven materials is typically easy to control, because the surfaces of such materials tend to provide stronger mechanical properties that make them more amenable to printing. See, e.g., EP Publication No. 0 604 729; Yeo U.S. Patent No. 5,503,076; Schleinz U.S. Patent No. 5,458,590. However, high resolution, multi-color registered graphics, which are consumer-preferred, usually cannot be printed on such materials. Thus the quality of the graphics that can be printed upon nonwoven materials is typically much lower than that which can be achieved by printing upon microporous film.

Microporous polymer films provide excellent surface characteristics that make them suitable for the printing of high resolution graphics. However, the existing microporous polymer films, see, e.g., Japanese Laid-Open Patent App. (Kokai) No. 9-25372, are not mechanically stable enough to support the printing of the high resolution, multi-color registered graphics that are consumer-preferred. This is due in large part to their thermal instability. The thermal shrinkage associated with existing microporous materials has made it difficult to exploit their ability to support the application of high resolution graphics.

It has also been found that a high degree of whiteness, i.e., the visual appearance of the white color of the article as seen by the consumer, is very important to the consumer. Consumers tend not to accept articles that incorporate films having a yellowish or off-white shade. In addition, breathability, the ability of the article to allow water vapor to escape, is important for wearer comfort and for consumer skincare acceptance. A lack of breathability may result in a hot, stuffy, skin-unfriendly product for the wearer.

Based on the foregoing, there is a need for disposable absorbent articles comprising a microporous polymer film that is mechanically stable enough to support the printing of high resolution, multi-color registered graphics, while also providing breathability and a high degree of whiteness. None of the existing absorbent articles provides all of the advantages and benefits of the present invention.

SUMMARY

The present invention is directed to a disposable absorbent article comprising a topsheet, a backsheet and an absorbent layer between the topsheet and the backsheet, wherein the backsheet is comprised of a microporous polymer film printed with a registered graphic and comprising by weight: from about 30% to about 60% of a polyolefin; and from about 40% to about 80% of calcium carbonate; wherein the film has a "b" value between about 0 and about 0.5 and exhibits less than about 2% thermal shrinkage at about 50°C and about 50% relative humidity for one week.

These and other features, aspects, and advantages of the invention will become evident to those skilled in the art from a reading of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description of preferred embodiments taken in conjunction with the accompanying drawings in which:

Figure 1 is a representation of a coordinate system for colorometric measurement;

Figure 2 is a partial top view of a preferred embodiment of the film of the present invention printed with registered graphics;

Figure 3 is a front view of a preferred embodiment of a disposable absorbent article having registered graphics; and

Figure 4 is a simplified plan view of another preferred embodiment of a disposable absorbent article having registered graphics.

DETAILED DESCRIPTION

All references cited herein are incorporated herein by reference in their entireties. Citation of any reference is not an admission regarding any determination as to its availability as prior art to the claimed invention.

All percentages herein are by weight of compositions unless specifically stated otherwise. All ratios are weight ratios unless specifically stated otherwise. As used herein, the term "comprising" means that other steps and other

ingredients which do not affect the end result can be added. This term encompasses the terms "consisting of" and "consisting essentially of."

The microporous polymer films that are preferred for use in the dsisposable absorbent articles of the present invention are formed from a mixture of a polyolefin, usually supplied as a resin, and calcium carbonate ($CaCO_3$) particles. Exemplary polyolefins preferred for use herein include polyethylene and polypropylene. Because polyethylene has a lower modulus and a lower melting point than polypropylene, it is generally easier to process than polypropylene. For this reason, polyethylene is more preferred. Alternatively, other thermoplastic polymers may be used for the films of the present invention. Preferably, from about 30% to about 60% of a polyolefin is used in the films of the present invention; more preferably, from about 45% to about 55% of polyethylene.

The $CaCO_3$ is used to provide microporosity, as described more fully below. However, it may tend to impart a slight yellow shade to the film. It is believed that any such yellow shade is highly unacceptable to consumers, who tend to prefer a bright, intense white appearance. A bright white appearance can be achieved by selecting a grade of $CaCO_3$ that has a very white color. A bright white appearance can also be achieved by adding a small amount of titanium dioxide (TiO_2) to the polyolefin and $CaCO_3$ during the mixing stage of the film formation process, if the grade of $CaCO_3$ used is not white enough to provide the finished film with the desired whiteness. In such a case, the addition of the TiO_2 counteracts the yellowing effect of the $CaCO_3$.

TiO_2 is generally whiter than $CaCO_3$, but it is also generally more expensive and more difficult to blend during extrusion. If TiO_2 is added, preferably it should be added in an amount less than about 5 wt%, since amounts greater than about 5 wt% may be difficult to process.

"Whiteness" as used herein generally refers to the absence of yellow. The whiteness of the microporous films herein may be measured using the Color Model of the ColorQUEST 45/0 instrumentation available from HunterLab, 11491 Sunset Hills Road, Reston, VA 22090 USA. See also, The Measurement of Appearance, Hunter, Richard S., Hunter Associates Laboratories, 9529 Lee HIghway, Fairfax, VA 22030 USA. The Color Model describes the color of any material on the basis of three parameters: L, a, and b. The Color Model may be graphically represented by the coordinate system shown in Figure 1. Referring

to Figure 1, in the coordinate system shown, "L" is a measure of the lightness of a sample, ranging from L=0 (blackness) to L=100 (whiteness). The quantities "a" and "b" are called opponent-type coordinates. They indicate the degree of redness (positive "a" values), greenness (negative "a" values); and the degree of yellowness (positive "b" values), blueness (negative "b" values). For neutral colors (e.g., white, gray, black), "a" and "b" should be about zero. The higher the values of "a" and "b" for a given sample, the more saturated or chromatic is the color of that sample.

The most important parameter for the films of the present invention is the "b" value, due to the lack of consumer acceptance of yellowish films. Using the ColorQUEST instrument under the conditions of the 10°/D65 international standard and a 10° reflecting angle, the "b" value for the films of the present invention is preferably between about 0 and about 0.5, more preferably as close to zero as possible.

In addition to the polyethylene and the $CaCO_3$, small amounts of other additives, such as antioxidants or lubricants, may also be added during the initial mixing stage of the film formation process. These other additives should preferably be added in the range of about 0.01 wt% to about 0.05 wt%.

"Microporosity" refers to the functional property of the film that permits an article such as a diaper to deliver improved skin health, because the microporous holes permit moisture vapor transmission between the inside of the diaper, i.e., the wearer's skin, and the outside of the diaper. Good moisture vapor transmission, or "breathability", also increases the wearer's comfort by providing a less stuffy feeling. The microporous holes in the films of the present invention are formed generally concentrically around the particles of $CaCO_3$ during the drawing stage of the film formation, as described more fully below. The microporous holes form on the surfaces of the film as well as throughout the thickness of the film, with the size of the microporous holes being related to the size of the $CaCO_3$ particles. In general, the size of the holes surrounding the particles is directly related to the size of the particle. Thus, small particles will cause the formation of small holes, while large particles will create large holes. However, limiting the size of the microporous holes is also important, because even though larger holes result in greater breathability, they also increase the risk of leakage.

The size of the holes may also be affected by the drawing ratio during the drawing step of the film manufacture. Preferably, to achieve optimal breathability, small sized $CaCO_3$ particles are used and the drawing ratio is about 2-3 times.

Moisture vapor transport rate ("MVTR") is a characteristic measure of breathability and "microclimate" inside the diaper. MVTR refers to the permissible moisture volume from one side of the film to the other side of the film per area unit (e.g., per square meter) and per time unit (e.g., per one day). High MVTR is desirable for good skincare because the air can be well ventilated between the inside and the outside of the diaper. However, if the MVTR is too high, the risk of odor, noticeable moisture leakage, or both is present. The control of MVTR is therefore important in applications involving microporous film technology.

The MVTR of a breathable film may be measured by the Cup Test method. This method is described as follows. A known amount of calcium chloride ($CaCl_2$) is put into a stainless steel container. The $CaCl_2$ with water level measurement useful herein may be purchased from Wako Pure Chemical Co., Ltd. A film sample is placed on the top of the container, and the container is tightly closed with a cap and screws. The cap has a hole through it and thus moisture outside the container can diffuse into the container through the film. The container with the film test sample is then placed in a constant temperature and humidity environment for a fixed period of time. The amount of moisture absorbed by the $CaCl_2$ in the container is a measure of the moisture permeability of the film.

Using the Cup Test method wherein the stainless steel container is a cylindrical container with a diameter of 30 mm and a depth of 50 mm, with constant environment conditions of 75% relative humidity and 40°C, the films of the present invention preferably have an MVTR of at least about 3200 grams/m² per day, with about 3700 grams/m² per day being more preferable for diapers. Preferably, the MVTR is as high as possible with no leaks.

The microporous polymer films of the present invention are preferably formed according to the following process. The polyolefin polymer, preferably from about 30% to about 60% and more preferably from about 35% to about 55% of polyethylene, and the $CaCO_3$, preferably from about 40% to about 80% and more preferably from about 45% to about 65% are mixed at a high temperature, preferably greater than the melting point temperature of the

polymer. For example, if polyethylene is used, the mixing temperature should be in the range of about 120°C to about 130°C. If TiO_2, and any other additives are to be included in the film, they should also be added to this initial raw material mixture at the outset of the process. If TiO_2 is to be added, it is preferably added at a level of less than about 5%.

After mixing, the mixture is fed through pullers and then pumped to an extruder. After extrusion, the mixture is cast as a thin film. Generally, the casting temperature is also greater than the melting point temperature of the raw material polyolefin polymer.

After casting, the film is drawn, while remaining at a temperature higher than ambient. The drawing step is the point at which the microporous holes form around the particles of $CaCO_3$. Drawing rolls are preferably used for the drawing step. The velocity of each drawing roll should basically be greater than that of the drawing roll preceding it. Thus, the velocity of the second drawing roll is greater than the velocity of the first drawing roll, with the first drawing roll having the lowest velocity of all the drawing rolls.

The drawing step locks in residual strain. After the film has been drawn, it is not thermally stable due to the energies existing between the molecules of the film. Thus, in order to achieve the thermal stability necessary to support the printing of high resolution graphics on the film, further processing is necessary.

The film in the drawn state is then annealed. It is believed that the annealing step eliminates the stresses between the micromolecules of which the film is comprised, and thus it is critical for providing the film with thermal stability. The annealing step provides the stress relief that would otherwise occur under storage and transport conditions at temperatures elevated above about the glass transition temperature T_g of the polyethylene (or other polymer) used. In other words, if annealing is not carried out as described herein, this stress relief will occur when the finished product that incorporates the film, e.g., a diaper, experiences the elevated temperatures associated with storage and transport. At that time, the stress will release, which generally distorts the appearance of both the product itself and especially the appearance of the registered graphics, and which may effect the overall quality of the film integrity.

However, if the annealing conditions are too strict, for example if the either the annealing temperature is too high, the annealing time is too long, or both,

many of the microporous holes will shrink at high tension, thereby decreasing breathability of the film.

After annealing, the film is preferably subjected to a corona treatment in which it is placed in a sealed environment at about ambient temperature. O_3 ions are radiated throughout the environment. It is believed that the corona treatment increases the dyne level for the printing side of the film, i.e., the side upon which the graphics are to be printed. High dyne levels indicate that each area of the printing ink will require less surface area on the film for adhesion; thus, the higher the dyne level, the higher and better the graphic resolution can be made. Films of the present invention preferably have a dyne level of greater than about 35 and more preferably greater than about 40.

After the corona treatment, the finished film can be rolled up or packaged in preparation for printing the registered graphics on the film, for example as shown in Figure 2. Printing techniques useful herein for providing multi-color registered graphics include flexographic printing process and gravure printing process, with flexographic printing being preferred.

An exemplary portion of a film of the present invention is shown in Figure 2. The film 10 is shown printed with the graphics 20 separated by pitch length P. It will be well understood by those of skill in the art that the graphics 20 may be of any shape, design, color or size, and that single or multiple designs may be used. Alternatively, pre-bonded, pre-applied, pre-cut, or pre-glued objects may be used. Timing marks 30 having a width W1 and a length L are also shown. Timing marks 30 are used so that the optical sensors of the combining and cutting mechanisms can detect the marks and thereby to properly align and to trim the film or film/nonwoven backsheet combination. Preferably, the timing marks are sized and placed such that they are removed when the film is trimmed, so that they are not a part of the finished product and thus not visible to the consumer. Alternatively, it may be part of the finished product but invisible to the consumer, while still being detectable by the machinery.

The distance between the timing mark and the edge of the film is referred to as a shadow mark. The shadow marks 40 are shown as having width W2 in Figure 2. For a disposable diaper manufacturing line, pitch length P of from about 475 mm to about 485 mm, width of timing mark W1 of from about 7 mm to about 10mm, length of timing mark L from about 20 mm to 25 mm, shadow mark

width W2 from about 0 to about 10 mm, and red color of timing mark for contrast are exemplary parameters for the timing marks.

As noted above, the films of the present invention exhibit high thermal stability as a result of the raw materials selection and the processing conditions, particularly the drawing and annealing steps. After the film has been formed and during the time in which it is subsequently stored, often in a warehouse where it is exposed to elevated temperatures after production, the film material tends to shrink. This shrinkage is a function of the time, temperature and humidity conditions of storage and transport, parameters that cannot readily be controlled. For example, during one week at 50° C, shrinkage levels of up to 5-10% have been observed for certain conventional films. Different levels of shrinkage can even vary within the same roll of film depending upon the level of tension that was used to wind the roll. This thermal instability has typically made it difficult to incorporate such films into consumer products in a phased relationship.

The thermal shrinkage rate of microporous films may be measured under the following conditions. Film samples are cut as 500 mm long in the machine direction and 150 mm wide in the cross direction. As used herein, "machine direction" means the direction of movement along a manufacturing line, and "cross direction" means the direction substantially perpendicular to the machine direction. The machine direction is represented by the arrow labeled MD in Figure 2. Two straight lines are drawn as 250 mm in the machine direction and 100 mm in the cross direction. The film samples are placed into an oven controlled at 50°C and 50% relative humidity for one week. The shrunken lengths of the lines are calculated as the thermal shrinkage rate, based upon the original lengths.

Under the test conditions described above, the films of the present invention typically experience only from about 0% to about 5% shrinkage in the machine direction, more preferably less than about 2%. In the cross direction, the films typically experience negligible shrinkage. Thus, the films of the present invention provide both the good surface characteristics of microporous polymer films that readily support high-resolution printed graphics while being susceptible to only negligible degrees of thermal shrinkage.

The films of the present invention also preferably have other desirable properties that are beneficial in the processing of the film in connection with the manufacture of absorbent articles. Although it will be understood by those of skill

in the art that the films of the present invention have many uses, for purposes of illustration the following description will focus upon use of the film as a backsheet for a disposable diaper.

Web modulus is important to the stable operation of a registered graphics phasing system. As used herein, "web modulus" means the mechanical property defined as the slope of a material's stress/strain curve. While the absolute value of the web modulus is not as important as its standard deviation within a roll of film, the modulus determines the amount of tension required to force an adjustment in the phase position of the film during processing. Films having a web modulus in the range of about 4000 g/in to about 13,000 g/in have been found to be preferred for the printing of high resolution graphics upon films useful as diaper backsheets.

Film caliper control is important to the winding of a roll of backsheet film and to its processability. The term "film caliper" refers to the thickness of the film. During the film making process, various localized levels of film shrinkage sometimes occur in the case of microporous films. A wide variation in film caliper may cause wrinkles or an uneven surface or both in a roll of film. During processing, caliper variations may cause film deformation, film breakage at the thinner areas, and line stoppage due to problems caused by tension control problems. Exemplary ranges for film calipers herein are in the range of about 0.022 mm to about 0.038 mm, with caliper variation of ±6.3%.

Thermal enthalpy (ΔH) is another important characteristic in providing heat resistance to the polymer film, especially during processes such as hot-melt glue lamination that may be part of a diaper manufacturing line. A high enthalpy characteristic can provide a broad range for adhesive temperature adjustment because the film materials have strong heat-resistance. As enthalpy increases, however, the stiffness of the microporous film material also increases, leading to possible issues with comfort and other manufacturing processes that depend on heat response of the film. Without being bound by theory, it is believed that the link between added stiffness and rising enthalpy is due to rising forces between macromolecules.

Basis weight refers to the weight of one square meter of planar web material. Exemplary basis weights herein are between about 20 grams per square meter (gsm) and about 40 gsm for films useful as a diaper backsheet.

Other film parameters that impact the printing process, the diaper manufacturing process, or both, include film width, length of the film roll, core diameter of the film roll, splices, timing marks, and printing orientation.

Printing orientation refers to the direction of travel of the graphic-printed film through the manufacturing line. For a disposable diaper manufacturing line, it has been found useful for the printed side of the microporous polymer film to be wound inside the roll, with the area that will become the front of the product leading first off of the roll, with the timing mark orientation on the left and the timing shadow mark on the right.

Referring to Fig. 3, there is shown a preferred embodiment of a disposable pull-on diaper 50, which is generally pulled onto the body of the wearer by inserting the legs into the leg openings 62 and pulling the article up over the waist. Generally, "pull-on diaper" refers to pull-on garments worn by small children and other incontinent individuals to absorb and contain body exudates. It should be understood that other pull-on garments such as training pants, incontinent briefs, feminine briefs, feminine hygiene garments or panties, and like, are included herein. It should further be understood that tape-type diapers are included herein.

Referring to Figures 3 and 4, the diaper 50 is generally comprised of a backsheet 52, a topsheet 54 and an absorbent layer 66 (shown in dashed lines in Figure 4) located between the backsheet 52 and the topsheet 54. The topsheet 54 is located to be placed facing the body or nearest the body when the diaper is worn and is generally provided with a liquid permeable region so that body exudates can flow through the topsheet 54 to the absorbent layer 66. The backsheet 52, which is placed away from the body during wear, is typically liquid impermeable so that outer clothing or other articles are not wetted by the body exudates. Preferably, the backsheet 52 is comprised of at least a microporous polymer film printed with registered graphics, as described herein. The backsheet 52 may further comprise a layer of nonwoven material laminated to the microporous film layer, in which case there is provided a more cloth-like and garment-like feel than is typically obtained with a film backsheet only.

Elastically extensible side panels 56 are provided to ensure more comfortable and contouring fit by initially conformably fitting the pull-on diaper 50 to the wearer and sustaining this fit throughout the time of wear well past when it

has been loaded with exudates. Leg elastics 58 and waist elastic region 60 are also provided to enhance the fit around the legs and waist, respectively.

Figure 3 shows the front view of the diaper 50 with an exemplary graphic 20 positioned in about the upper region of the backsheet, on the front side of the diaper 50. In Figure 4, there is shown a simplified plan view of an embodiment of a disposable absorbent article in its flat, uncontracted state prior to formation. In this embodiment, graphic 20 is shown in the back region of the diaper with graphics 22 additionally shown in the front region.

As will be understood by those of skill in the art, many other features for disposable absorbent articles are within the scope of the present invention. For example, barrier cuffs as described in Lawson and Dragoo U.S. patents 4,695,278 and 4,795,454 are a desirable feature for disposable absorbent articles. In addition, skin care-type topsheets that are provided with lotion thereon for the purpose of reducing skin irritation and chafing are a desirable feature herein.

The aspects and embodiments of the present invention set forth herein have many advantages, including bright white appearance, the capacity to support high resolution, multi-colored registered graphics, and thermal stability.

EXAMPLE

The following example further describes and demonstrates a preferred embodiment of the microporous polymer film for disposable absorbent articles within the scope of the present invention. The example is given solely for the purpose of illustration, and is not to be construed as a limitation of the present invention since many variations thereof are possible without departing from its spirit and scope.

Polyethylene and $CaCO_3$ are used as the starting materials. The film is cast and drawn in the machine direction. The film has the following properties:

Basis weight	34.3±0.42 gsm
Thickness by caliper	0.042±6.3% mm
Heat Shrinkage	
MD	1.4%
CD	0.0%
Mechanical Property	

MD:	Load at 1%	114 g/in
	Load at 3%	269 g/in
	Load at 5%	389 g/in
	Load at Peak	1260 g/in
	Strain at Peak	188 %
CD:	Load at Peak	460 g/in
	Strain at Peak	386 %
MVTR (Cup Test)		3600 g/m²/24 hr
Whiteness		
	L: white/black	93.46 %
	a: red/green	-0.24
	b: blue/yellow	0.35
Pitch Size for Registered Marks		480 ±4 mm
Mark Width		10±0.2 mm
Mark Length		20±0.5 mm
Shadow Mark Width		0.0 ±1.0 mm

The mechanical property of the film refers to tensile strength at a percent strain or at peak, where strains in the range of about 1% to 5% represent strains in the elastic range of the material. After the film has been formed, it can be printed with registered graphics and incorporated into a disposable absorbent article, for example as part of the backsheet of a disposable diaper.

It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to one skilled in the art without departing from the scope of the present invention.

WHAT IS CLAIMED IS:

1. A disposable absorbent article comprising a topsheet, a backsheet and an absorbent layer between the topsheet and the backsheet, wherein the backsheet is comprised of a microporous polymer film printed with a registered graphic and comprising by weight:

a. from about 30% to about 60% of a polyolefin; and

b. from about 40% to about 80% of calcium carbonate;

wherein the film has a "b" value between about 0 and about 0.5 and exhibits less than about 2% thermal shrinkage at about 50°C and about 50% relative humidity for one week.

2. The article of claim 1 wherein the polyolefin is selected from the group consisting of polyethylene and polypropylene.

3. The article film of claim 2 comprising by weight from about 35% to about 55% of polyethylene; and from about 45% to about 65% of calcium carbonate.

4. The article of claim 3 further comprising up to about 5% by weight of titanium dioxide.

5. The article of claim 1 wherein the film has a moisture vapor transmission rate of at least about 3200 grams/m² per 24 hours.

6. The article of claim 1 wherein the film has a web modulus of from about 4,000 g/in to about 13,000 g/in.

7. The article of claim 1 wherein the film has a printing side having a dyne level of greater than about 35.

8. The article of claim 1 wherein the backsheet further comprises a layer of a nonwoven material laminated to the film.

9. The article of claim 1 wherein the registered graphic is printed by a flexographic printing process.

10. The article of claim 1 wherein the registered graphic is printed by a gravure printing process.

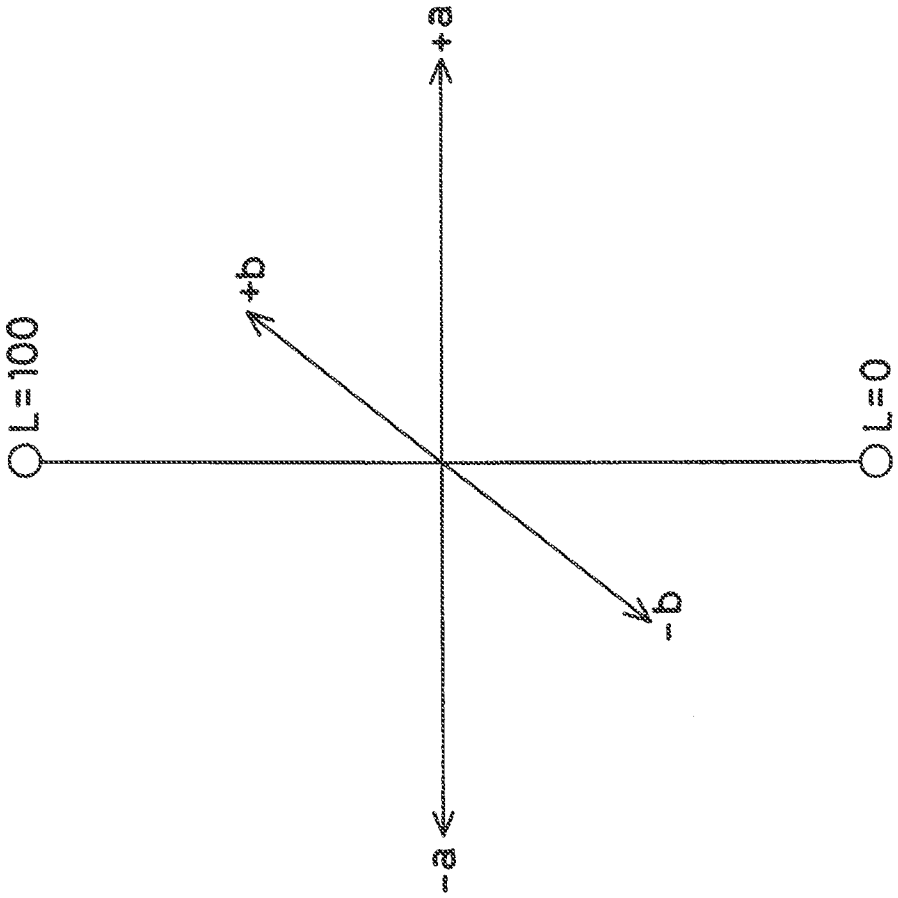

FIG. 1

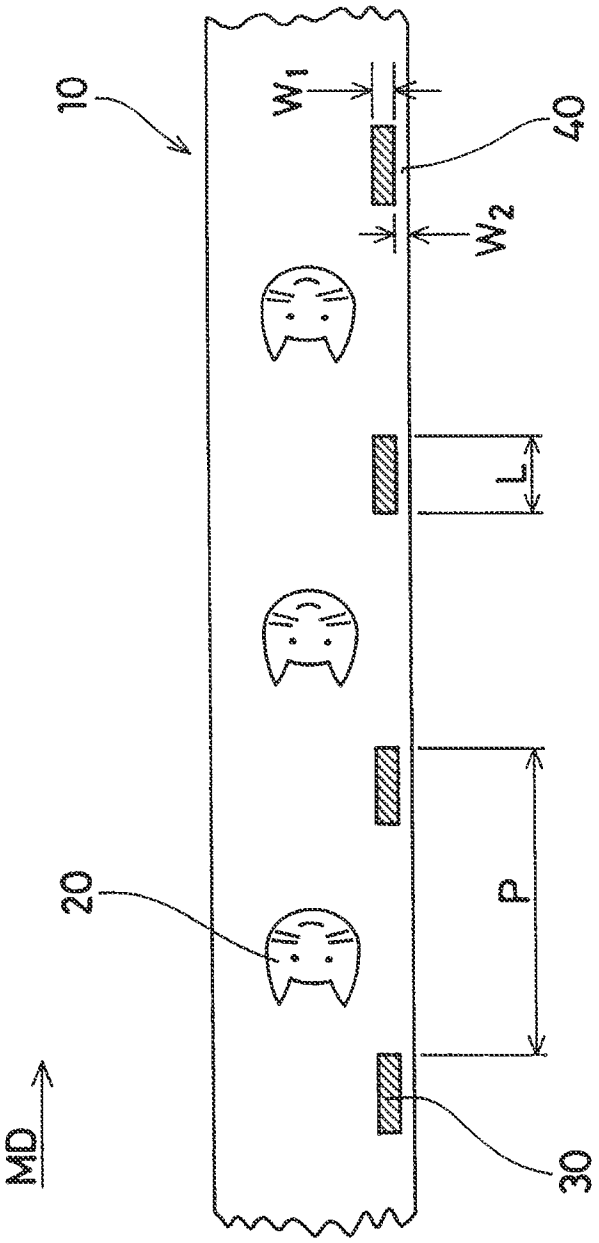

FIG. 2

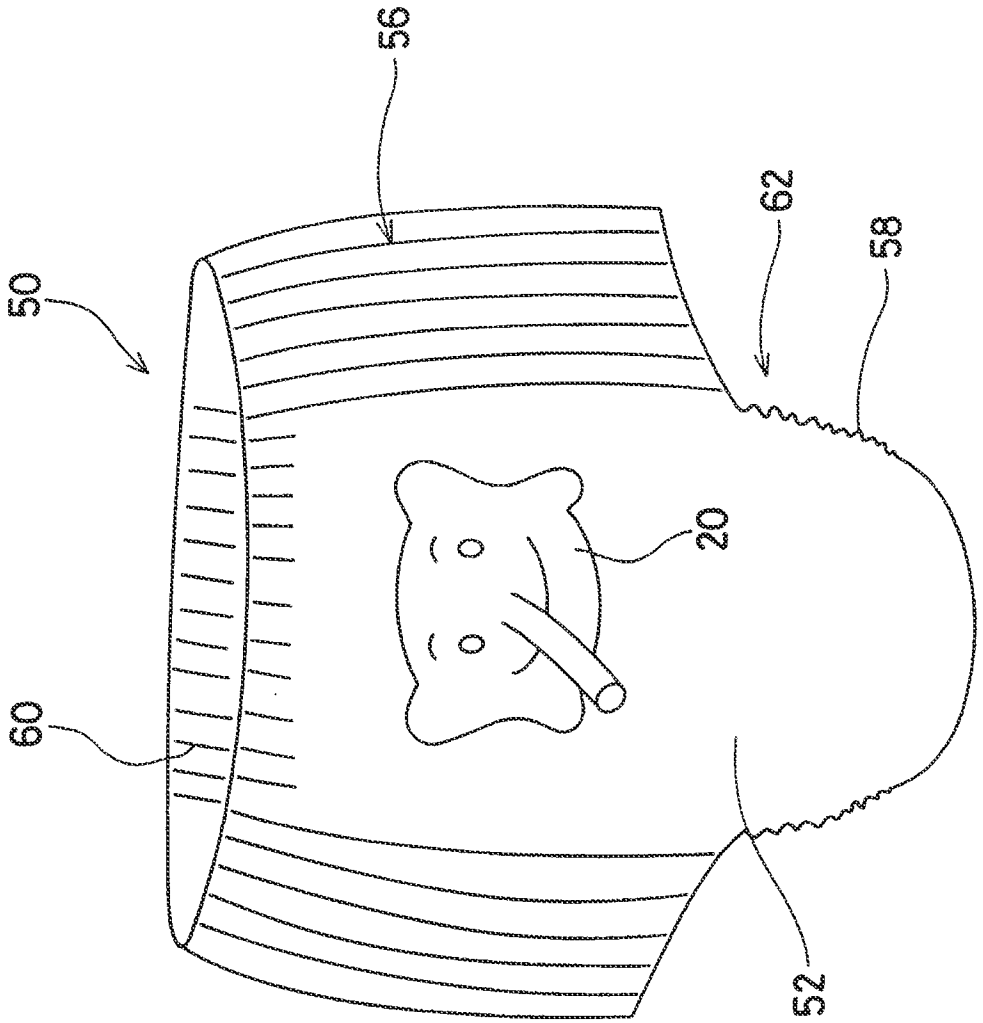

FIG. 3

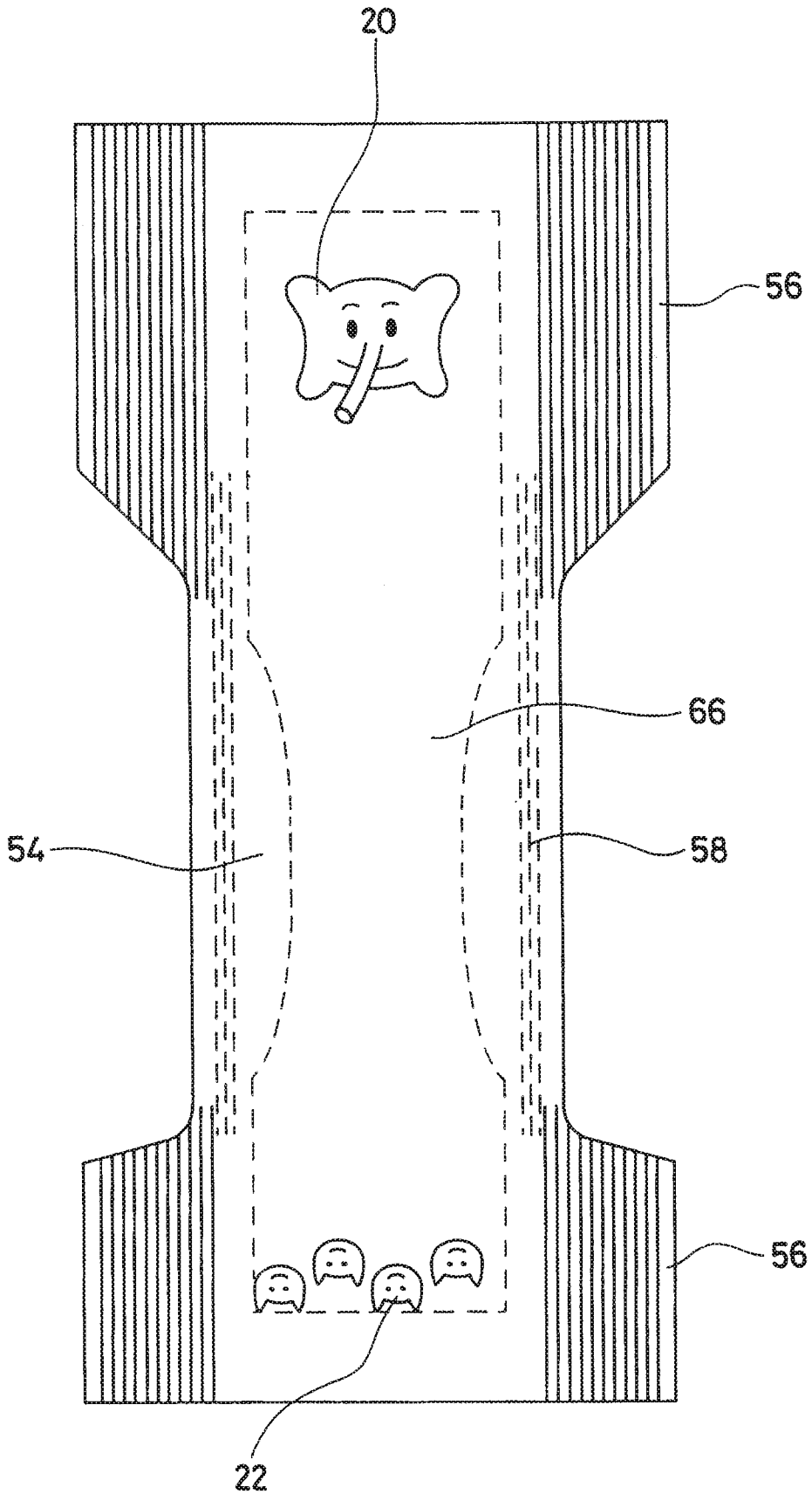

FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 97/23613

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61L15/18 A61L15/24 C08K3/26 A61L15/42

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61L C08K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 352 802 A (HERCULES INC) 31 January 1990 see page 1, line 39 - line 47 see page 1, line 51 - page 2, line 26 see page 2, line 29 - line 42 see claims; examples	1-3
A	GB 2 210 375 A (OJI YUKA GOSEISHI KK) 7 June 1989 see page 1, line 28 - page 5, line 8 see page 6, line 5 - line 8 see page 7, line 17 - line 25	1-4,10
A	WO 94 04606 A (GAIA RES LP) 3 March 1994 see page 3, line 7 - line 31 see page 4, line 13 - line 23 see page 9, line 12 - line 18	1-3,9,10

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 August 1998	20/08/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Cousins-Van Steen, G

INTERNATIONAL SEARCH REPORT

Ir. ational Application No
PCT/US 97/23613

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	WO 95 26208 A (KAO CORP ;SAKAI YOSHIHIRO (JP); MAEDA KATSUSHI (JP); KUMAMOTO YOSH) 5 October 1995 see page 12, paragraph 4 - page 13, paragraph 6 see claims; examples	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

In ational Application No
PCT/US 97/23613

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RELATED PROCEEDINGS INDEX

[No decisions have been rendered.]